

Clean Rooms & Laboratories High-Tech Industries

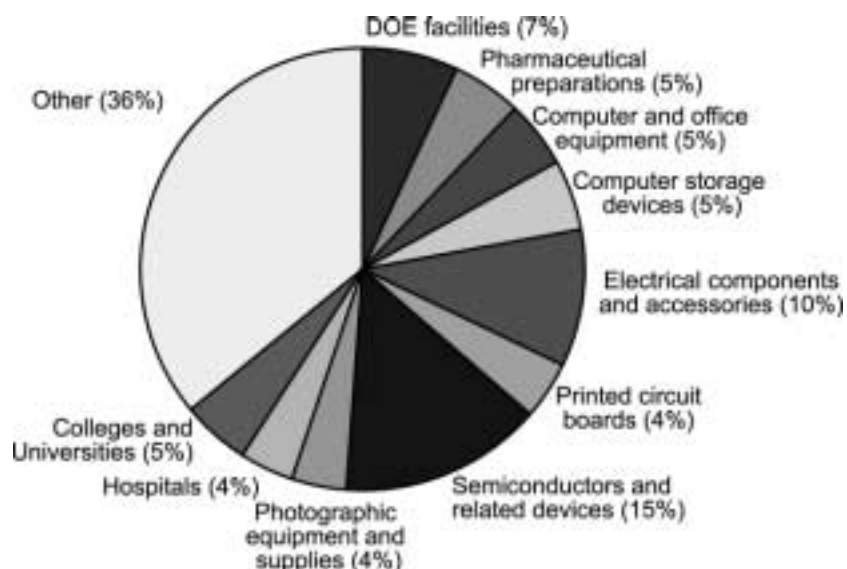
Executive Summary

California's laboratories and clean rooms have unique needs for controlled environmental conditions that are extremely energy-intensive. The HVAC energy intensities for these buildings are 4 to 100 times higher than the average commercial building. This market is large and growing rapidly with the trend toward even more energy-intensive spaces. In California, these facilities consume about 2 GW of electrical demand, approximately 9.4 billion kilowatt-hours of electricity, and 25 trillion BTUs of natural gas each year.

Research has shown that there are major opportunities for energy savings in this sector. Key findings include:

- Savings of 30 to 50 percent of the building's energy use are achievable using current technology.
- The target for energy savings should often be the heating, ventilating, and air conditioning (HVAC) systems, which can account for 50 percent or more of the total energy use.
- Laboratory fume hoods drive a large fraction of the HVAC energy. A new technology for fume hood design developed by LBNL can save up to 70 percent of conventional design.
- There is wide variation in the efficiency of existing HVAC systems.
- Despite widespread industry perceptions to the contrary, energy costs can be controlled in buildings for high technology industries.

The opportunities for improving the energy efficiency in this building type cut across a large number of diverse industries. Figure 1 shows the percentage of total electrical consumption in the high-tech building sector in California by various industries.



High Tech Industrial Building Electrical Consumption



Project Results

Eight project components were identified with each component having a goal to serve as the basis of a multi-year RD&D effort to improve energy efficiency in high tech buildings. The following reports on the objectives, outcomes, and conclusions for each project component and the progress towards reaching the goal. The eight project components and goals were:

1. **Design Intent Documentation:** Development of a methodology and a tool to capture design intent information and performance expectations for use throughout the building's life cycle.
2. **Laboratory Fume Hood Containment:** Reduced fume hood airflow requirements by at least 50 percent while improving hazard containment. Developed the containment technology for use in other industrial ventilation applications such as for semiconductor manufacturing.
3. **Laboratory Airflow Design:** Developed airflow design criteria and tools to optimize fan power consumption.
4. **Field Studies/Performance Feedback:** Developed a standard methodology for benchmarking complex laboratory facilities. Provided performance feedback to designers and operators.
5. **Technology Transfer:** Developed design guides, Web sites, workshops, and other technology transfer mechanisms.
6. **Clean Room Benchmarking:** Improved energy efficiency and performance of clean rooms through benchmarking across industries.
7. **Clean Room Analysis Tools:** Developed HVAC energy analysis and design tools for clean rooms.
8. **Industry Liaison:** Formed collaborative alliances with industry organizations to assure success in the marketplace.